

Chapter 10: Atmospheric Water

Evaporation

Vaporization

Sublimation

Condensation

Freezing

Melting

gas

solid

liquid



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All the changes in water have many possibilities of why they may occur

1. God's perfect design
2. The force of the water molecules and how much energy is required to move around
 - a. Molecules are 2 or more atoms stuck together
 - b. Speed of movement depends on how much thermal energy the molecules have
 - c. Collisions of fast moving molecules is what allows the water to escape the ocean or lake or whatever water they come from and change form
 - d. If the molecule has little thermal energy it will likely drop back into the body of water it came from
 - e. If it has lots of energy it will float off into the atmosphere

Section 10B

Relative humidity:

Absolute humidity:

Dew point: temperature at which the relative humidity reaches 100%

- Because the water can only hold so much moisture, some of it will reappear near the ground in the form of frost or dew

10.5 Clouds and Cloud Formation

1. Clouds: masses of water droplets or ice crystals that are massed together and suspended in the air
2. Form when the temperatures of an air mass warms up causing humidity which allows for evaporation causing the formation of clouds
3. Adiabatic cooling: humid air from a lower level cools as it is forced upward
 - a. The higher it goes the more pressure the air encounters
 - b. As it encounters higher pressure, the air expands
 - c. No energy is used to cause the air's expansion
 - d. The energy that caused the expansion is the thermal energy of the water molecules in the air mass
 - e. There is water vapor in the air if it meets the right condition it will condense into water droplets
 - f. Condensation nuclei: air particles that must be present to form the water droplets
 1. Sea salt
 2. Smoke
 - g. Freezing nuclei: when the dew point is 32° the droplets turn directly into ice crystals when microscopic debris are present

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4. Types of clouds

a. Clouds form as a result of air movement

1. Horizontal movement causes the formation of cloud layers
2. Vertical movement forms clumps and billows and lowering clouds

b. Basic cloud types

1. Stratus :thin layers
2. Cumulus: piles or billows of clouds
3. Cirrus: wispy curly clouds
4. Nimbus: clouds that cause precipitation
 - Dark gray on bottom often bringing heavy rain or snow

c. Low level clouds

1. Stratus
 - Can be what causes fog or drizzle
2. Nimbostratus
 - Dark
 - Long steady rain
3. Strato-cumulous
 - Low layer of piled clouds
 - Flat on bottom
 - Billowy on top

d. Middle level clouds

1. Alto-stratus
 - 20,000 ft above sea level
 - Flat layers
2. Alto-cumulus
 - Higher than alto-stratus
 - White and fluffy looking
 - Appear in layers
 - Appear smaller than actual size due to the height

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e. High level clouds

1. 20,000-40,000 feet
2. Made of ice crystals
3. Cirrus clouds
 - Thin wispy featherlike
4. Cirrostratus
 - Thin veil like clouds
 - Allow enough sunlight to pass through that ground objects cast shadows
5. Cirrocumulus
 - White patches that look like flakes or cotton balls

f. Vertically developed clouds

1. Cumulonimbus
 - Billowy
 - Extend from 1,000 feet up to 33,000 feet up
 - Often called thunderheads
 - a. Associated with thunderstorms
 - b. Flat on top
 - c. Often appear tower-like
2. Cumulus
 - Appear puffy
 - Appear as individual clouds

10 C: Water Leaving the Atmosphere

1. How does water get from the sky to the ground

a. Dew

- A cooler surface causes the temperature of the air to decrease the dew point
- Air must be calm because moving air would dry the dew up

b. Frost

- Same process as with Dew except temperature must be cold enough to cause the water to freeze instead of form droplets

c. Precipitation: all forms of water falling from the atmosphere

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d. Formation of Rain

- Water droplets form together to make clouds
- Coalescence: with high humidity large droplets form and then collide with others forming bigger droplets which then rain down

e. Causes of Precipitation

- Convection
- Movement of air over a mountain range or groupings of mountains (called Orographic)
- Front: the boundary between 2 air masses of differing temperatures collide
- Convergence: a collision of horizontal air masses

f. Liquid Precipitation

- Rain
- Freezing rain (super-cooled water that falls and freezes onto surfaces such as power lines)
- Drizzle

g. Solid Precipitation

- Snow
- Sleet
- Hail